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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,757	11/12/2003	Stephen Y. Chou	PRUN 9237USC1	7832
1688	7590	04/14/2010	EXAMINER	
Polster, Lieder, Woodruff & Lucchesi, L.C. 12412 Powerscourt Dr. Suite 200 St. Louis, MO 63131-3615			TRAN, BINH X	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/706,757	<b>Applicant(s)</b> CHOU ET AL.	
	<b>Examiner</b> Binh X. Tran	<b>Art Unit</b> 1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-6,8,10-17,19,30,35-47,49 and 55-69 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6,8,10-17,19,30,35-47,49 and 55-69 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Double Patenting***

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

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Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1-6, 8, 10-17, 19, 30, 38-44, 46-47, 49, 55-60 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-17, 19-20 of copending Application No. 11/980,918 in view of Chou, Krauss, and Renstrom ("Nanoimprint Lithography", Journal of Vacuum Science Technology B 14(6), pages 4129-4132, 1996), herein after refer as Chou (Journal of Vacuum Science Technology).

The independent claim 1 of the present application (10/706,757) differs from claim 1 of copending application 11/980,918 by further disclosing the polymeric film blended with a release agent to include an internal mold release agent. However, claim 16 of copending application 11/980,918 clearly disclose the present of mold release agent. Chou (Journal of Vacuum Science Technology) teaches to bend mold release agent to the polymer film in order to reduce resist adhesion to the mold (See page 4129, col. 2, 2nd paragraph; or page 4131, col. 2, 3<sup>rd</sup> paragraph). It would have been obvious to one having ordinary skill in the art, at the time of invention, to have the polymeric composition blended a release agent to include an internal release agent because it helps to reduce resist adhesion to the mold.

The claims of the present application differ from the claim of co-pending application 11/980, 918 by further disclosing the step of photocuring, thermally curing, or both thermally curing and photocuring the polymeric composition. However, claim 1

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of co-pending application 11/980,918 clearly disclose the step of solidify the film comprises polymeric composition. Further, claims 10, 14 of the copending application 11/980,918 disclose the polymer is subjected to photocuring step.

The independent claims 30, 38, 49 further disclose the present of thermosettable polymeric composition, and/or a photocurable composition and/or thermoplastic composition. However, claim 9 of the copending application 11/980,918 discloses the polymeric composition comprises a photocurable polymeric composition, a thermoplastic composition, a thermosettable polymeric composition, or any combination thereof.

This is a provisional obviousness-type double patenting rejection.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-4, 6, 8, 10-12, 14-17, 19, 30, 35-40, 42-44, 46-47, 49, 55-56, 58, 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou Krauss, and Renstrom ("Nanoimprint Lithography", Journal of Vacuum Science Technology B 14(6), pages 4129-4132, 1996), herein after refer as Chou (Journal of Vacuum Science Technology), in view of Gebhardt et al. (US 5,731,086).

Regarding claim 1 and 30, 38, Chou (Journal of Vacuum Science Technology) teaches a method for forming a pattern in a film carried on a substrate said method comprising:

obtaining a mold of a material (such as silicon dioxide or silicon), which mold is hard relative to the film (page 4129, col. 2 page 4130 Fig 1),

the film comprising a polymeric composition (such as PMMA) blended with a release agent to include an internal mold release agent and capable of being deformed by said mold a temperature between 140-180 °C (See page 4129, col.2; page 4130, Fig 1; page 4131, col. 2, 3<sup>rd</sup> paragraph; read on applicant's range of less than 200 °C);

the mold having first and second protruding features spaced apart from each other and a recess formed thereby , the first and second features and the recess having a shape forming a mold pattern and providing at least one mold pattern lateral dimension which is less than 200 nm ("sub-25 nm features"; page 4129, page 4130, Fig 1);

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urging the mold into the film under a molding pressure, whereby the thickness of the film under the protruding features of the mold are reduced (fig 1), thereby forming the mold pattern in the film;

solidifying the mold-deformed film for the next process (See Fig 1-5);

removing the mold from the film; and removing from the film the areas of reduced thickness, thereby exposing portions of the surface of the substrate which underlie the thin region such that the exposed portions of the surface of the substrate substantially replicate the mold pattern and have at least one lateral dimension which is less than 200 nm (See page 4129; Fig 1, 2, Fig 4).

Regarding to independent claims 1, 30, Chou (Journal of Vacuum Science Technology) does not explicitly disclose the step of photocuring or thermal curing or both the polymeric composition. However, Chou (Journal of Vacuum Science Technology) clearly discloses to heat the polymer to a temperature of 140-180 °C (page 4129, col. 2). Gebhardt teaches to thermal curing and/or photocuring the polymeric composition (col. 25 lines 15-59, col. 48 lines 58-67) in order to cure and harden the film. It would have been obvious to one having ordinary skill in the art, at the time of invention to modify Chou (Journal of Vacuum Science Technology) by thermal curing and/or photocuring the polymeric composition in order to cure and harden the film.

Regarding to independent claims 1, 30, 38 Chou (Journal of Vacuum Science Technology) fails to disclose the polymeric compositions comprises a thermosettle composition and a photocurable composition. Regarding to claim 49, Chou (Journal of Vacuum Science Technology) also fails to disclose the polymer composition comprises

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a photocurable polymer. However, Chou (Journal of Vacuum Science Technology) clearly teaches to use thermoplastic polymer (page 4129, col. 1). Gebhardt teaches to use thermosettable polymer composition and a photocurable composition which is capable of being deformed at 23.5 °C with superior duplication pattern with minimal loss of debossment precision of the grooved pattern (col. 10 lines 1-35, col. 11- 12, ) or the mixture of thermoset and thermoplastic (col. 26). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Chou (Journal of Vacuum Science Technology) in view of Gebhardt by using thermoset polymer which is capable of being deformed at a temperature less than 200 °C because it has superior duplication pattern with minimal loss of debossment precision of the grooved pattern.

Respect to claim 2, Gebhardt discloses a homopolymer, copolymer, block copolymer (col.40 line 34-47). Respect to claim 3, 39, 55 Gebhardt teaches the polymer comprises poly (vinylacetate) (See col. 42 lines 57-60, col. 44 lines 45-51).

Respect to claims 4, 40, Gebhardt teaches the use oligomer comprises an epoxy resin (col. 11 lines 5-7, col. 13 lines 38-40, col. 38 lines 50-55). Respect to claim 8, Gebhardt discloses the thermosettable polymer is capable of being deformed at room temperature (col. 10 lines 1-20).

Respect to claims 6, 38, and 42, Gebhardt discloses the polymer comprises a crosslinker including divinyl benzene (col. 25 lines 1-14, col. 39 lines 55 to col. 40 line 5, col. 40 lines 35-48). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Chou (Journal of Vacuum Science Technology) in



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view of Gebhardt by having crosslinker including divinyl benzene because it will help to toughening the polymer.

Respect to claim 8, Gebhardt teaches the polymer composition is capable of being deformed at room temperature (23.5 °C, col. 7 lines 45-51).

Regarding to claim 10-12, Chou (Journal of Vacuum Science Technology), in view of Gebhardt teaches the method of claim 1. Chou (Journal of Vacuum Science Technology) in view of Gebhardt et al. do not teach wherein said photocurable polymeric composition is capable of curing in less than about 2 seconds (claim 10); wherein said photocurable polymeric composition has a viscosity of greater than about 2 poise at 25°C (claim 11); or wherein the viscosity in the range of 10 poise to about 30 poise (claim 12). However, Chou (Journal of Vacuum Science Technology) clearly discloses the viscosity value is changed depend on temperature (page 4129, col.1) Further, curing time is a result effective variable, which could be adjusted based on process conditions to achieve desirable stability of the film. It is also dependent on temperature. Also, viscosity is a result effective variable, which could be adjusted based on process conditions to achieve a balance between stability upon application to substrate, deformability when imprinted, and structural stability after imprinting. Furthermore, viscosity is dependent on temperature.

Regarding claim 14, Chou (Journal of Vacuum Science Technology) in view of Gebhardt et al. teach the method of claim 1. The cited prior arts do not teach wherein said photocurable polymeric composition is capable of crosslinking in less than about 2 seconds. However, crosslinking time is a result effective variable, which could be

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adjusted based on process conditions to achieve desirable stability of the film. It is also dependent on temperature

Regarding claims 10-12, 14, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Respect to claims 15-17, Gebhardt also teaches it is possible for the polymer comprises plasticizer, monomer, additive in order to enhance polymer composition at various percentage (col. 42-43, col. 44 lines 44-52, col. 45 lines 53-60, Table in col. 46-47).

Respect to claim 19, Chou (Journal of Vacuum Science Technology) discloses the pattern dimension includes 25 nm feature size which overlapping applicant's claimed range in claim 19 (page 4129).

Respect to claims 35-37, Gebhardt teaches the thermosettable is hardened by a thermal treatment (i.e. curing process) and the photocurable is harden by UV exposure (col. 11 lines 5-7, col. 25 lines 19-40). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Chou (Journal of Vacuum Science Technology) in view of Gebhardt by thermally curing and UV cured the polymer because it helps to harden the polymer.

Respect to claims 43-44, 46-47, Chou (Journal of Vacuum Science Technology) disclose the mold imprint at least one layer of composite (page 4129; Note the material comprises one layer of polymer resist and mold release agent). Respect to claims 43-44, 46-47, Gebhardt disclose the mold imprint at least one layer or multiple layers of

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composite (Fig 1B-1F, col. 48). Respect to claim 55, Gebhardt teaches the thermoplastic polymer comprises poly (vinylacetate) (col. 42 lines 26-60, col. 44 lines 45-52).

Respect to claim 56, Gebhardt teaches the thermoplastic polymer comprises polymer of butyl methacrylate (col. 20 lines 60-64, col. 45 lines 30-35). Respect to claim 58, Gebhardt teaches the thermoplastic polymer comprises polystyrene (col. 45 lines 39-40). Respect to claim 60, Gebhardt discloses the thermoplastic polymer comprises copolymer of vinyl acetate/vinyl chloride (col. 44 lines 50-60).

6. Claims 5, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (Journal of Vacuum Science Technology), and Gebhardt as applied to claims 1-4, 6, 8, 10-12, 13-17, 19, 30, 35-40, 42-47, 49, 55-56, 58, 60 above, and further in view of Ito et al. (US 2002/0102490 A1).

Regarding claims 5 and 41, Chou (Journal of Vacuum Science Technology) in view of Gebhardt et al. teach the method of claim 1. Chou (Journal of Vacuum Science Technology) does not teach a monomer composition. In the same field of endeavor, Ito et al. teach a monomer comprising alkyl methacrylate ("alkyl methacrylates"; Paragraph 39), fluorinated alkyl methacrylates.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Chou (Journal of Vacuum Science Technology) and Gebhardt with a functional equivalent such as Ito et al by using the monomer comprising alkyl methacrylate, because it will enhance the performance of the photoresist layer

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7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (Journal of Vacuum Science Technology), and Gebhardt as applied to claims 1-4, 6, 8, 10-12, 13-17, 19, 30, 35-40, 42-44, 46-47, 49, 55-56, 58, 60 above, and further in view of Yamamura (Us 5,981,616).

Regarding claim 13, Chou, Chou (Journal of Vacuum Science Technology) and Gebhardt et al. teach the method of claim 9. Chou (Journal of Vacuum Science Technology) does not teach an oligomer. Gebhardt et al. teach an oligomer of epoxy resin (Column 11, Lines 6-7). In the same field of endeavor of forming photocurable resins, Yamamura et al. teach wherein said photocurable polymeric composition comprises an oligomer, said oligomer comprising silicon atoms ("oligomers having a polysiloxane backbone"; Column 3, Lines 34-36, Column 16, Lines 10-15).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Chou (Journal of Vacuum Science Technology) and Gebhardt et al. with Yamamura et al. for the benefit of forming three dimensional structures using polymers with targeted photocurable properties such as excellent mechanical strength and minimal shrinkage.

8. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (Journal of Vacuum Science Technology), and Gebhardt as applied to claims 1-4, 6, 8, 10-12, 13-17, 19, 30, 35-40, 42-44, 46-47, 49, 55-56, 58, 60 above, and further in view Wang et al. (US 5,529,891).

Regarding to claim 57, Chou (Journal of Vacuum Science Technology) and Gebhardt fails to disclose the thermoplastic polymer comprises

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poly(methylhexadecylsiloxane). However, Chou clearly teaches to use thermoplastic polymer. Gebhardt also teaches to use thermoplastic polymer. In a photographic element, Wang teaches to use poly(methylhexadecylsiloxane) (See col. 3 lines 42-46).

It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Chou (Journal of Vacuum Science Technology) and Gebhardt in view of Wang by using polymer comprises poly(methylhexadecylsiloxane) because equivalent and substitution of one for the other would produce an expected result.

9. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (Journal of Vacuum Science Technology), and Gebhardt as applied to claims 1-4, 6, 8, 10-12, 13-17, 19, 30, 35-40, 42-44, 46-47, 49, 55-56, 58, 60 above, and further in view of Oguni et al. (US 5,866,294).

Regarding to claim 59, Chou (Journal of Vacuum Science Technology) and Gebhardt fails to disclose thermoplastic polymer comprises poly(octadecyl methacrylate). However, Chou (Journal of Vacuum Science Technology) clearly discloses to use polymer with low glass transition temperature includes poly methyl methacrylate. Gebhardt also teaches to use teaches to use thermosettable polymer composition and a photocurable composition which is capable of being deform at 23.5 °C with superior duplication pattern with minimal loss of debossment precision of the grooved pattern (col. 10 lines 1-35, col. 11- 12, ) or the mixture of thermoset and thermoplastic (col. 26). Oguni teaches to use Polymethacrylates with low glass transition temperature include, for example, poly(decyl methacrylate), poly(dodecyl methacrylate), poly(2-ethylhexyl methacrylate), poly(octadecyl methacrylate), poly(octyl

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methacrylate), poly(tetradecyl methacrylate), poly(n-hexyl methacrylate), poly(lauryl methacrylate), etc (col. 19 lines 1-7). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Chou (Journal of Vacuum Science Technology) and Gebhardt in view of Oguni by using poly(octadecyl methacrylate) polymer because equivalent and substitution of one for the other would produce an expected result.

10. Claims 45, 61-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (Journal of Vacuum Science Technology), and Gebhardt as applied to claims 1-4, 6, 8, 10-12, 13-17, 19, 30, 35-40, 42-44, 46-47, 49, 55-56, 58, 60 above, and further in view of Park et al. (US 2003/0017424 A1).

Regarding to claims 45, 61-69, Chou (Journal of Vacuum Science Technology), and Gebhardt fails to disclose the step of thermal curing and photo curing after imprinting (claim 45); or post imprint thermal baking (claims 61, 64, 67); or post-imprint UV exposure (claims 62, 65, 68) or post-imprint thermal baking and post imprint UV exposure (claims 63, 66, 68). However, Gebhardt clearly teaches to thermal cure and/or photocuring during imprint. Park teaches to fix the pattern after imprint by thermal treatment or UV exposure or other appropriate curing means (paragraph 0005, 0031, 0033, Fig 7). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Chou (Journal of Vacuum Science Technology), Gebhardt in view of Park by perform thermal treatment, UV exposure because it helps to fix and solidify the pattern. Further, Park teaches these step are optional (paragraph 0033).

***Response to Arguments***

11. Applicant's arguments with respect to claims 1-6, 8, 10-17, 19, 30, 35-47, 49, 55-69 have been considered but are moot in view of the new ground(s) of rejection. Specially, the applicants argue that Gebhardt fails to disclose the polymeric composition blended with a release agent to include an internal mold release agent. The new cited prior art, Chou (Journal of Vacuum Science Technology), disclose polymeric composition blended with a release agent to include an internal mold release agent (See page 4129, col. 2, 2nd paragraph; or page 4131, col.2, 3rd paragraph).

Upon further consideration, the examiner provide a new ground of rejection under 35 USC 103(a) as discussed above using the combination of new cited prior arts along with some of the previous cited prior arts.

***Conclusion***

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X. Tran whose telephone number is (571)272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

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Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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